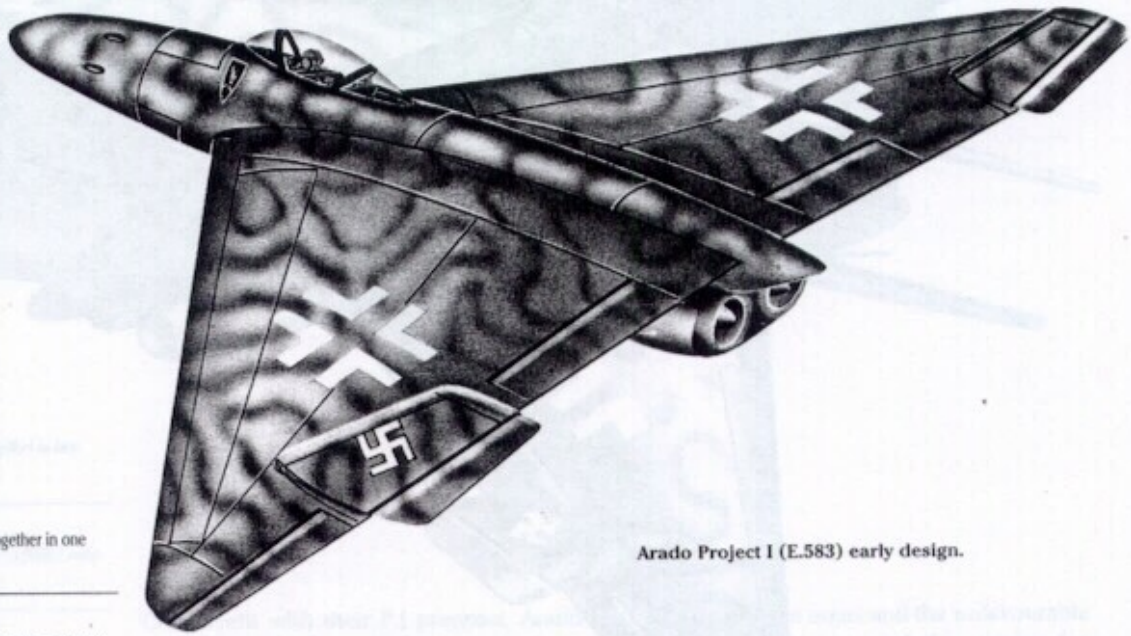
Arado Project I

January-March 1945



Arado Project I (E.583) early design.

Crew

Pilot, radar operator and navigator in ejection seats together in one pressure cabin.

Powerplant

Two Heinkel HeS 011A turbojets each rated at 1,300kP (2,865lb) static thrust, semi-buried in rear fuselage.

Dimensions

Span	18.40m	60ft 4in
Sweep	35° at 0.25 chord	
Wing area	75.0m²	807ft²
Aspect ratio	4.5 : 1	
Length overall	12.95m	42ft 6in
Height overall	3.80m	12ft 6in

Weights

As per the Arado tender		
Empty equipped	9,300kg	20,502lb
Normal loaded	14,700kg with	32,407lb with
	5,400 litres of fuel	1,187 gallons of fuel
Max loaded	15,700kg with	34,611lb with
	6,600 litres of fuel	1,451 gallons of fuel
Max wing loading	209kg/m²	42.8lb/ft²

Performance

According to EHK comparison figures calculated with a standard specified fuel load of 4,000kg or 4,800 litres (8,818lb/1,055 gallons).

Max speed	810km/h at 9,000m	503mph at 29,500ft
Initial rate of climb	11.6m/sec	38ft/sec
Service ceiling	12,600m	41,300ft
Max endurance* 3.15 hrs	at 450km/h	at 279mph
	at 6,000m	at 20,000ft

* With one engine shut down

Armament (definitive version)

Two fixed forward-firing 30mm MK 213 cannon in nose, two oblique upward-firing 30mm MK 108 cannon near aircraft centre of gravity, two rearward-firing 30mm MK 213 cannon in tail as defensive armament. Weapon load: Two 500kg (1,102lb) bombs as conversion set.

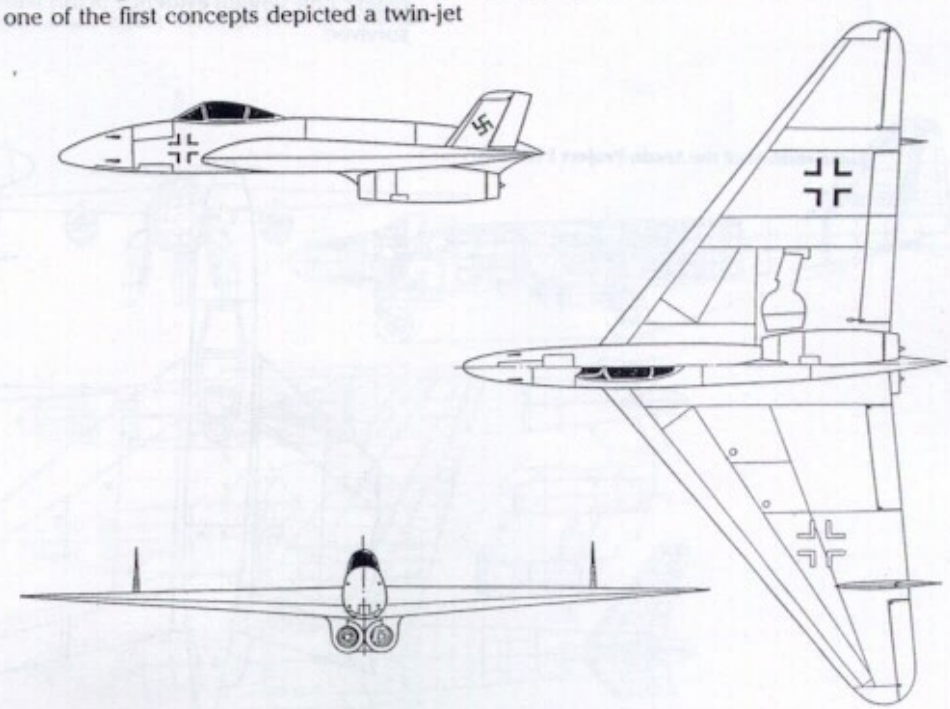
Electronic equipment

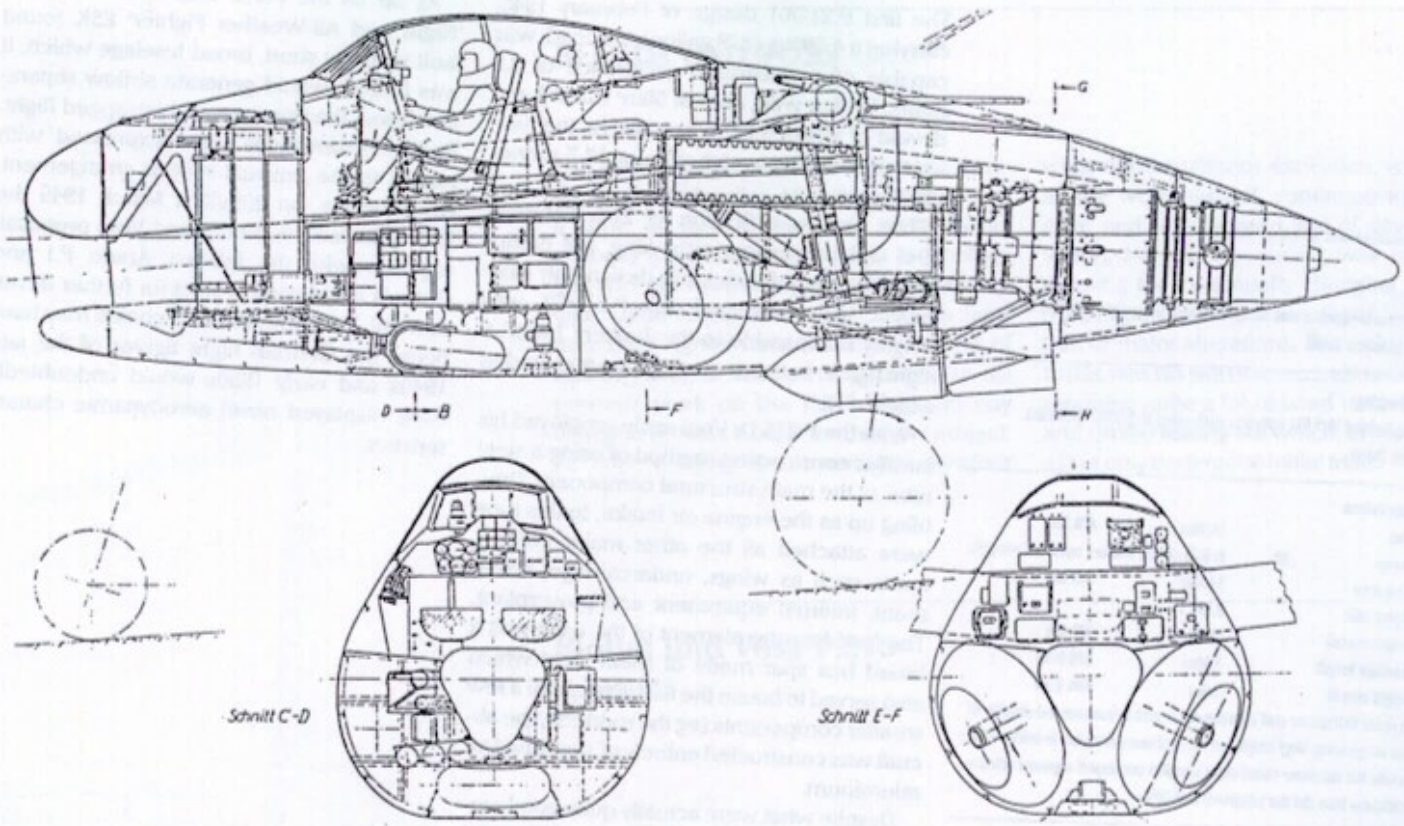
FuG 24, FuG 29, FuG 25a, FuBl 3, FuG 101, Peil G6 and APZ 6, FuG 244, FuG 280.

Aerodynamically this aircraft was based on the tail-less design studies already undertaken by Arado for the E.555 bomber project and the E.581 fighter proposal.

A characteristic of this and all other Arado tail-less night fighter designs was the wing-mounted fin and rudder assemblies which also served as boundary layer fences.

Following the 27th January specification, one of the first concepts depicted a twin-jet night and all weather fighter with an almost deltaform wingplan. In March, responding to the upgraded requirements, a larger design was completed with a broader fuselage intended to accommodate a third crew member and increased fuel capacity. This now featured a swept wing. It was in this latter form that the project was submitted by Arado to the EHK in Berlin.





Blohm und Voss P.215 tail-less night fighter.

LUFTWAFFE
SECRET PROJECTS
FIGHTERS 1939-1945

Midland Publishing
Limited

di Cristian Camozzi

I temerari tentativi di realizzare velivoli discoidali, alcuni riusciti, altri naufragati, fanno riflettere sull'ingegno dei loro progettisti

I DISCHI TERRESTRI

È DEL 3 APRILE 2007 L'ARTICOLO DEL GIORNALISTA SCIENTIFICO LUIGI BIGNAMI PUBBLICATO SULLA REPUBBLICA CON IL TITOLO *«DISCHI VOLANTI:* *operazione Pentagono - gli USA investono per costruire i prototipi»*. Nell'occhiello, il pezzo precisava: *«Il progetto si chiama "GFS Projects" e prevede la realizzazione di aeroplani sullo stile e la tecnica degli "oggetti non identificati". Storia di una sfida che parte da lontano»*. L'articolo continua: *«La sigla sta per Geoff's Flying Saucer, e identifica la costruzione dell'aeromobile in grado di sollevarsi dal suolo, librarsi in aria, muoversi a zig-zag e atterrare dolcemente. Operazioni che nel dettaglio ricordano gli aneddoti legati all'uso dei dischi volanti»*. E viene posto quindi questo interrogativo: *«Il Pentagono è ossessionato dai dischi volanti?»*. Al che, la storia va raccontata.

I più conosciuti

Di velivoli a forma discoidale ne sono stati progettati parecchi nel periodo attorno alla Seconda Guerra Mondiale e alcuni di essi sono stati costruiti. Tra questi, quelli più documentati sono l'AS-6 e il V-173 o XF5U-1.

Nel Giugno 1939, ebbe luogo a Leipzig-Mockau in Germania la prima gara nazionale di aeromodelli con motori a combustione. Arthur Sack vi partecipò con il suo modello ad ala circolare chiamato AS-1. Sfortunatamente, il modello doveva essere lanciato a mano e aveva scarse caratteristiche di volo. Ernst Udet, all'epoca ministro tedesco dell'Aviazione, incoraggiò Arthur Sack a continuare le sue ricerche sui modelli ad ala circolare. Sack costruì quattro modelli di dimensioni sempre maggiori, culminando con il suo primo aereo con equipaggio, il Sack AS-6 che

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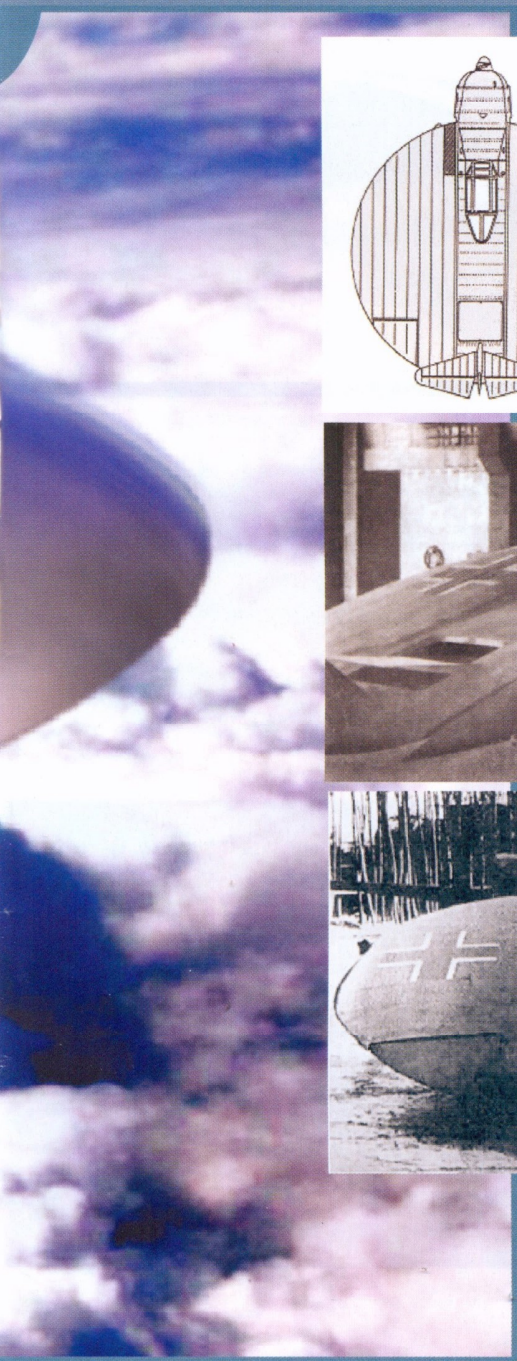
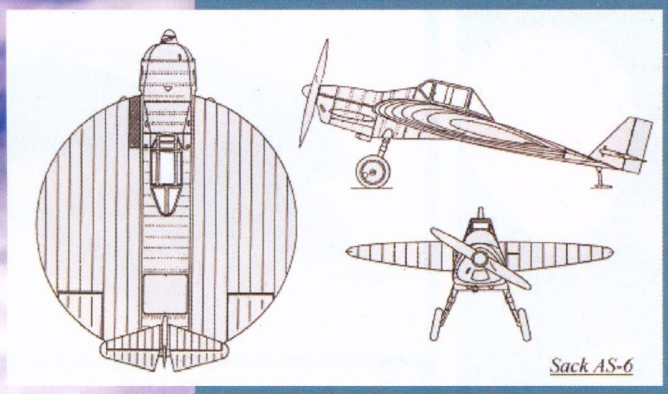
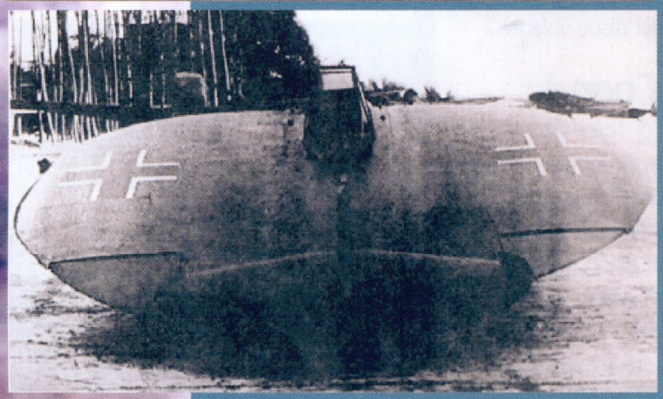
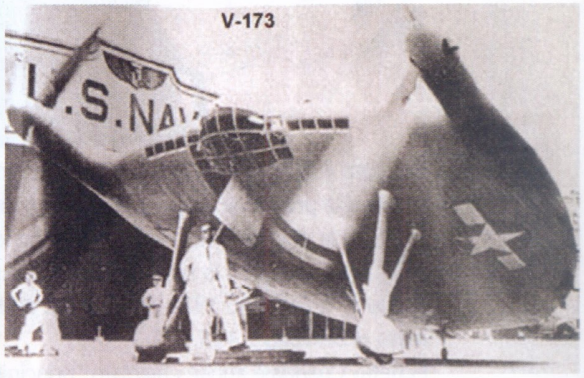




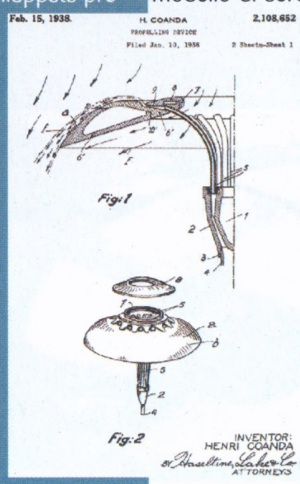




fu terminato all'inizio del 1944. La Marina militare americana commissionò un nuovo velivolo nel 1939 alla Vought Aircraft Company. Progettato durante il conflitto da Charles H. Zimmerman, l'XF5U-1 "Flying Flapjack" era un caccia sperimentale della Marina USA. Charles H. Zimmerman probabilmente fu il primo a realizzare un aereo discoidale per ragioni aerodinamiche e già all'inizio del 1930 vinse una "NACA design competition" con un disco sagomato capace di volare ad alte velocità e in grado di librarsi. L'XF5U-1 - caratterizzato da un look evidentemente insolito - consiste principalmente in un corpo piatto a forma di disco che funziona da superficie di sostentamento e che gli permette di restare librato nell'aria. Questo progetto multimilionario fu il primo aereo V/STOL, cioè capace di decollo e atterraggio verticale. Il prototipo originale si chiamava V-173 (Flying Pancake), mentre la versione sviluppata prese il nome di XF5U-1. Non ho certezza del loro impiego nei teatri di guerra di allora, ma sembra che furono più d'uno gli avvistamenti di oggetti la cui descrizione assomigliava ai Flying Flapjack. Con lo sviluppo dei motori a reazione e a causa di alcuni problemi di vibrazioni nei riduttori dei motori e di costi eccessivi, la Marina militare abbandonò il progetto ufficialmente il 17 Marzo 1947 (a quanto risulta dai dati a disposizione). Benché questi bolidi e tutti quelli simili tendano ad assomigliare vagamente a un disco volante, restano ben lontani dagli oggetti non identificati, perché volano ancora con sistemi convenzionali: infatti sono dotati tutti di elica per trainarli e di ali (benché a forma di disco) per sostenerli. Per trovare qualcosa di non convenzionale, bisogna tornare più indietro nel tempo, prima ancora della costruzione dell'AS-6 e dell'XF5U: all'anno 1932.

La scoperta di Coanda

Tutto ebbe inizio nel 1932 a Bucarest, dove un ingegnere dell'aeronautica, il rumeno Henri Coanda, dopo aver distrutto un suo modello di aeroplano, fece una scoperta sensazionale: un particolare comportamento dei fluidi. Coanda notò che un fluido tende a seguire il contorno della superficie sulla quale incide se la curvatura della superficie, o l'angolo di incidenza del flusso con la superficie, non sono troppo accentuati. Applicò questo principio a un oggetto a forma di disco; succhiando l'aria

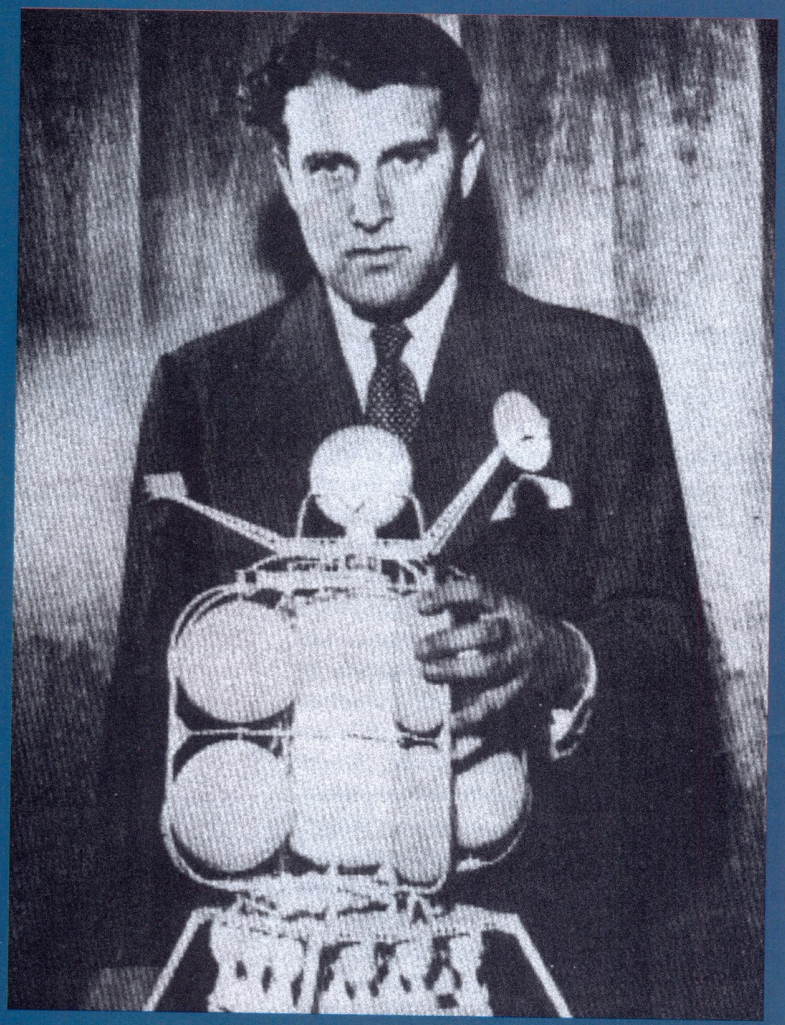


IN APERTURA
Illustrazione realizzata da Alberto Forgione.

In Alto a Sinistra I progetti discoidali ideati da Sack e i prototipi testati. A destra, gli sviluppi americani ottenuti da Zimmermann. Sotto: il principio dell'Effetto Coanda.

8/07

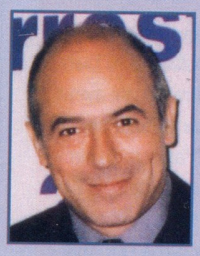
Conferme a Corso e al SOM 1-01



von Braun sapeva

Uno scienziato NASA, Clark McClelland, dichiara: l'ingegnere missilistico tedesco ispezionò i rottami del crash di Roswell e vide i corpi degli alieni

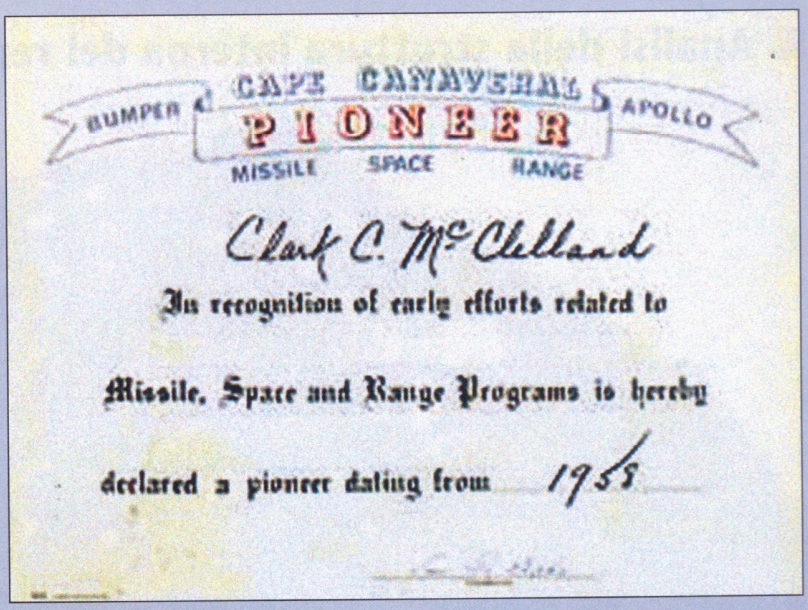
▲ di Maurizio Baiata ▲



L'ingegnere aerospaziale Clark C. McClelland, specialista Nasa dal 1958 al 1992, ha confermato in un'intervista esclusiva a CNI News - in merito all'incidente UFO avvenuto presso la città di Roswell nel 1947 - il coinvolgimento dell'ingegnere missilistico tedesco Wernher von Braun (1912-1977), nell'ispezione in loco sullo scafo precipitato e sui corpi di esseri alieni. *"Il Caso Roswell resta il più importante e documentato nella storia di crash/retrieval (schianto/recupero) di UFO"* dichiara McClelland. Lo scienziato spiega come venne a conoscenza del ruolo avuto da von Braun nella vicenda: *"Durante i miei lunghi anni di servizio nel programma spaziale della nazione ebbi la fortuna di conoscere e scambiare alcune informazioni di grande interesse con scienziati tedeschi trasferiti in USA mediante l'Operazione Paper Clip dopo la Seconda Guerra Mondiale. Erano l'élite del gruppo scientifico addetto ai programmi missilistici tedeschi sotto il controllo di Adolf Hitler. Ebbi spesso il privilegio di conversare con il loro capogruppo, il dottor Wernher von Braun e con altri scienziati assegnati alle squadre addette al lancio della ABMA (Army Ballistics Missile Agency) alle rampe di lancio di Cape Canaveral. Questi stessi uomini furono infine conglobati nella nuova organizzazione National Aeronautics and Space Administration (NASA)"*. Le affermazioni di McClelland, del quale sono accessibili via internet le credenziali e l'altisonante curriculum professionale (come evidenziato dalle immagini in queste pagine) costituiscono la piena riprova sia di quanto appare sui recenti

documenti attribuiti al gruppo Majestic 12 (cfr. Notiziario UFO n°2 - Febbraio 1999), sia di quanto esposto dal colonnello Philip J. Corso nel best seller "Il Giorno Dopo Roswell", in merito al ruolo di primaria importanza svolto da Wernher von Braun nell'incidente di Roswell. Ecco come prosegue la testimonianza di McClelland: *"Nel corso degli incontri periodici del MFA (Manned Flight Awareness) che si tenevano a Cocoa Beach, ero solito scambiare battute in libertà con alcuni di questi scienziati, in particolare con il dottor von Braun. Una sera, durante una pausa, mi ritrovai con lui nella veranda posteriore del Cocoa Beach Ramada Inn. Gli dissi di sapere che all'epoca dell'incidente il suo*

gruppo era di stanza nei pressi del luogo del crash, il poligono White Sands Testing Range, dove venivano sperimentati i lanci dei missili V-2 catturati ai Tedeschi. Fu allora che gli rivolsi una domanda che lo fece accigliare. 'C'è stato o no, un Caso Roswell? È stata recuperata un'astronave aliena insieme ai corpi alieni? Ha avuto la possibilità di visitare il luogo dell'incidente?' *Il dottor von Braun, fumatore accanito, accese una sigaretta, ci pensò su un attimo e poi cominciò a parlare senza esitazioni della sua ispezione al velivolo schiantato. Si fidava di me in quanto gli avevo giurato che non ne avrei fatto parola ai giornali, a riviste, alla televisione, ecc. Non ho mai infranto quel giuramento. Ormai è morto, e l'incidente avvenne oltre cinquant'anni fa. Ecco perché oggi rivelo la sua versione, ho il diritto di parlare - persino di cose che secondo alcune agenzie "non esistono". Il dottor von Braun spiegò che lui e i suoi colleghi (per ora i nomi restano riservati) vennero portati sul luogo dello schianto ed entrarono nel perimetro appena allentato il cordone di sicurezza dei militari. Condussero le loro analisi alla svelta. Mi disse che il velivolo non sembrava costituito di un metallo conosciuto. Sottolineò che appariva fabbricato con un materiale biologico, come la pelle. Rabbrividii e mi venne*



da pensare che forse il velivolo era 'vivo'. I corpi recuperati furono temporaneamente tenuti in una tenda medica nei paraggi. Erano piccoli, molto fragili ed avevano grosse teste. Gli occhi erano grandi. La pelle era grigiastra e della consistenza dei rettili. Disse che era simile al tessuto squamoso dei serpenti a sonagli, che aveva visto spesso a White Sands. La sua ispezione dei rottami lo aveva confuso: erano frammenti sottili, color alluminio, come la carta d'alluminio della gomma da masticare. Molto leggeri ed estremamente resistenti. Gli interni del velivolo erano praticamente spogli di attrezzatura, come se le creature e il veicolo spaziale fossero parte di una singola unità. Fu allora che davvero mi sentii perso. Ritornammo alla cerimonia di onorificenza, alla quale von Braun era stato invitato, e poi ci salutammo. Tornai a casa con la testa che mi girava per tutto quello che avevo sentito. Mi è stato molto difficile mantenere il silenzio per tanti anni, soprattutto perché tentato dai miei molti amici e colleghi che credono negli UFO, ET, ecc. Al tempo non riferii nulla, né al maggiore Keyhoe né al NICAP, né al pubblico. Ho fatto questo onorando l'inviolabilità del mio giuramento. L'USAF (Aeronautica Militare Statunitense, ndr.) e il Governo Federale - conclude McClelland - *restano tutt'oggi ancorati alla versione secondo la quale a Roswell sarebbe precipitato un pallone sonda d'alta quota, nome in codice Mogul, un progetto sviluppato per rilevare le esplosioni nucleari in Unione Sovietica. Inoltre, secondo l'USAF, i corpi recuperati erano manichini di prova paracadutati sul deserto e finiti nella zona dello schianto del 'pallone'. In sostanza, l'USAF si è attestata su questa versione inventata e l'ha spacciata per vera all'opinione pubblica americana".* ▲

Clark McClelland, ex operatore dello Space Shuttle, per 34 anni è stato ingegnere aerospaziale a Cape Canaveral ed al Kennedy Space Center, per i progetti Atlas, Titan, Minuteman, per tutti i programmi spaziali con equipaggio a bordo (Mercury, Gemini, Apollo, Space Shuttle) e per la pianificazione avanzata della stazione spaziale internazionale.

In apertura, Wernher von Braun. In base alle dichiarazioni di Clark McClelland (nella foto in questa pagina), l'ingegnere tedesco ispezionò l'interno dell'UFO precipitato a Roswell nel 1947. Se le informazioni di McClelland corrispondessero a verità, si avrebbe un passo avanti nella conoscenza delle operazioni successive all'incidente, oltre a rappresentare una conferma di enorme spessore alle informazioni, riguardanti von Braun, rilasciate dal colonnello Corso. A fronte, l'attestato commemorativo a Clark McClelland dopo il successo della missione Apollo 11. Sopra, la targa di merito da lui ottenuta quale pioniere dell'era spaziale.

ARADO

Following on from the unsuccessful E.580, the Arado design bureau at Landeshut in Silesia began development of a fighter incorporating the latest in aerodynamic technology. Initial work on Project E.581 dated back to November 1944. Featuring a typically Arado wing planform designed specifically for high speed flight it was originally intended for the aircraft to be powered by the BMW 003 turbojet then in production. The reasoning for this decision is not clear, other than perhaps the desire to get an aircraft built and into the air as quickly as possible. Nor is it known whether Arado was undertaking this work on its own initiative or in response to an official contract from Berlin.

Professor Walter Blume's team based their aerodynamic concept on, among others, the E.555 long range bomber, of which there were no fewer than 14 development studies. Most of these depicted an aircraft characterised by a short span wing with reduced outboard sweep.

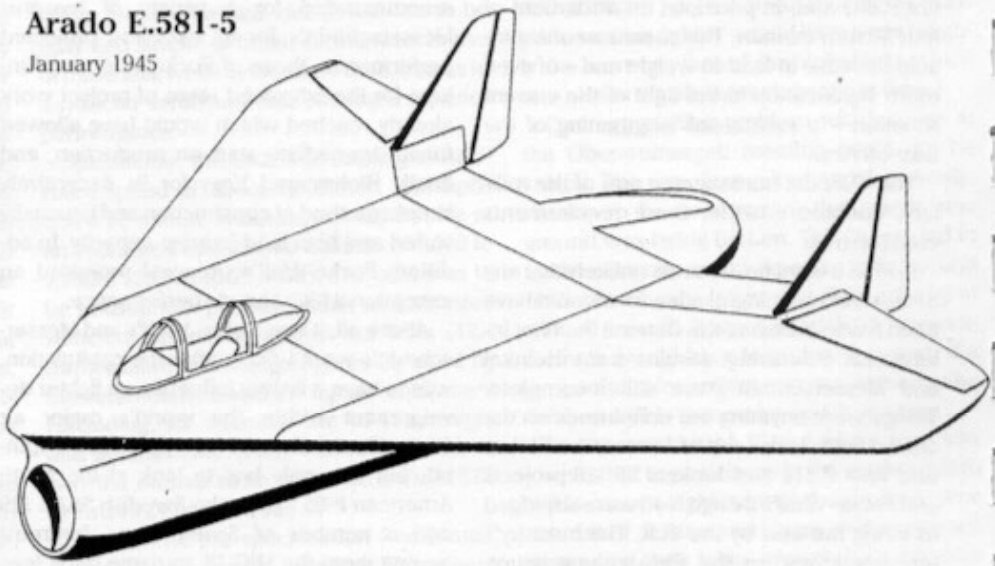
The abandonment of the long range bomber project at the end of November 1944 released additional capacity for the development of the fighter. At the beginning of 1945 Arado adapted their E.581 design to conform to the on-going specifications for the high performance fighter powered by the HeS 011.

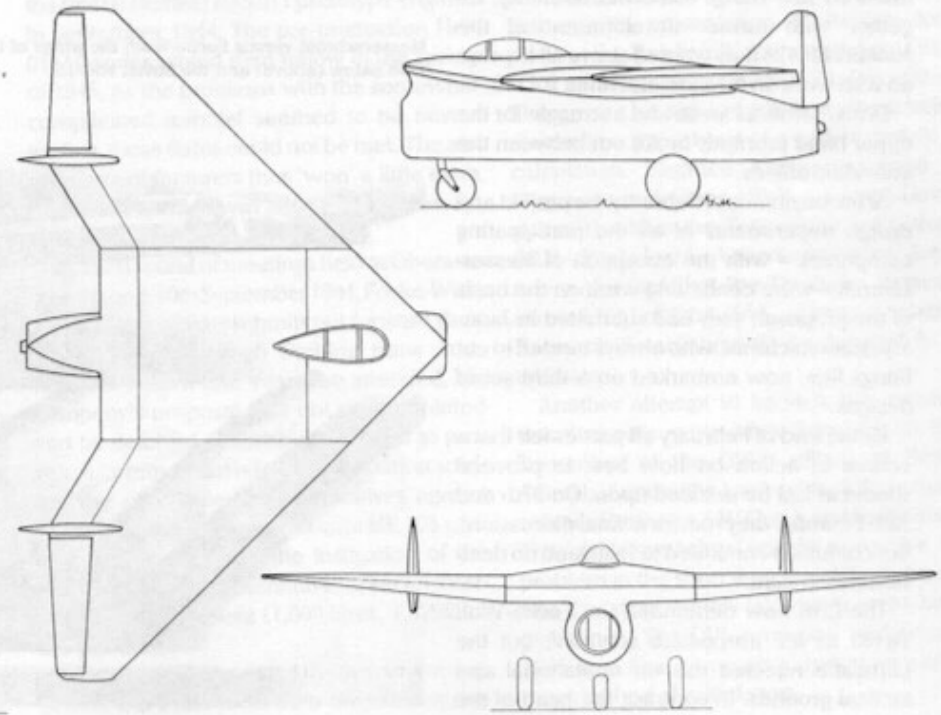
Relatively little is known of the E.581-1, '581-2 and '581-3 studies. But of the somewhat larger E 581-4 and '581-5 proposals – which differed only in detail – general arrangement drawings, weight tables, and sketches have survived.

Arado obviously ceased work on this design after the Luftwaffe issued its new requirements and concentrated instead on further development of the Ar 234 and their plans for the night fighter of the future.

Arado E.581-5

January 1945





Powerplant

One Heinkel HeS 011 turbojet rated at 1,300kP (2,865lb) static thrust.

Dimensions

(E.581-4 and E 581-5)		
Span	8.95m	29ft 2½in
Sweep	45° at leading edge	
Wing area	24.5m²	263ft²
Aspect ratio	3.27 : 1	
Length overall	5.65m	18ft 6in
Height overall	2.60m	8ft 6in

Weights

Empty equipped	2,454kg	5,410lb
Loaded	3,734kg with 1,400kg (1,250litres) of fuel	8,231lb with 3,086lb (274 galls) of fuel
Max wing loading	152.4kg/m²	31.2lb/ft²

Performance

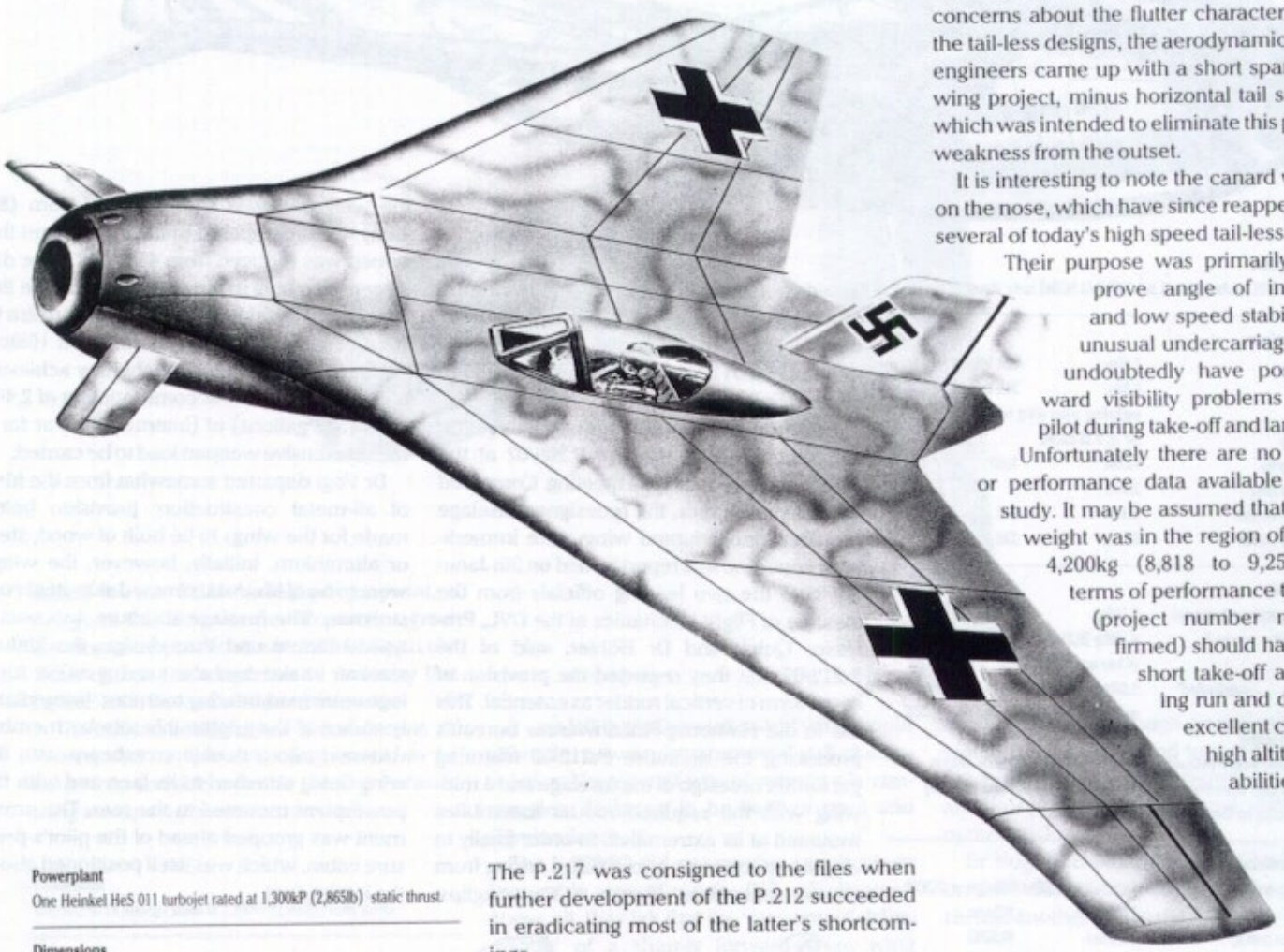
No data are available. The inherent danger of duct loss from the long intake and, above all, the large surface areas with their various corners and edges would seem to indicate insufficient high speed performance. On the other hand, the low wing loading figure points to manoeuvrability and good climb and high altitude characteristics. Take-off and landing speeds should also have been superior to those of its competitors. Fuel capacity would not have sufficed for the endurance required.

Armament

Two 30mm MK 108 cannon in wing roots.

Blohm und Voss Ae 607/P.217

February 1945



When the DVL adjudicators began voicing concerns about the flutter characteristics of the tail-less designs, the aerodynamicists and engineers came up with a short span swept wing project, minus horizontal tail surfaces, which was intended to eliminate this possible weakness from the outset.

It is interesting to note the canard winglets on the nose, which have since reappeared on several of today's high speed tail-less aircraft. Their purpose was primarily to improve angle of incidence and low speed stability. The unusual undercarriage would undoubtedly have posed forward visibility problems for the pilot during take-off and landing.

Unfortunately there are no weights or performance data available for this study. It may be assumed that take-off weight was in the region of 4,000 to 4,200kg (8,818 to 9,259lb). In terms of performance the P.217 (project number not confirmed) should have had a short take-off and landing run and displayed excellent climb and high altitude capabilities.

Powerplant

One Heinkel HeS 011 turbojet rated at 1,300kP (2,865lb) static thrust.

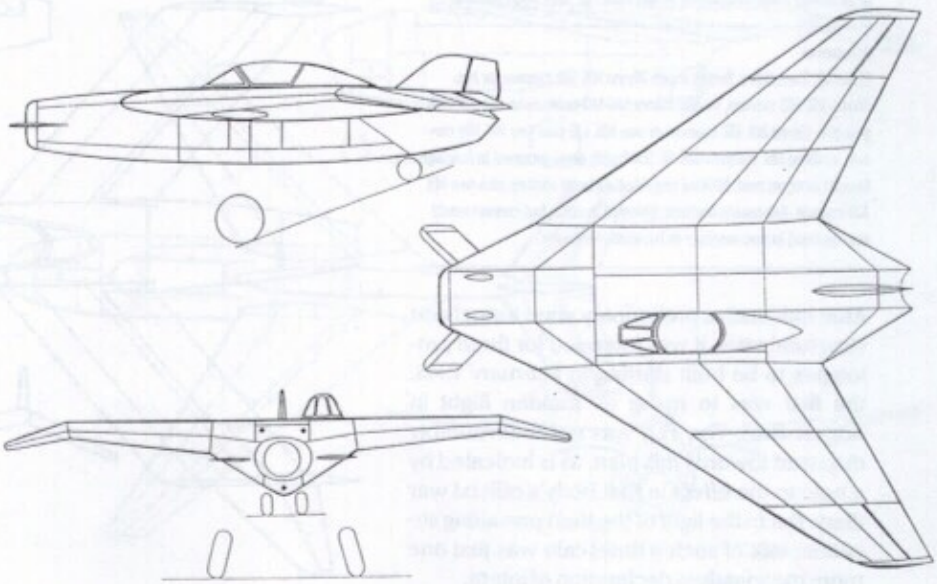
Dimensions

Span	8.00m	26ft 3¼in
Sweep	45° at 0.5 chord	
Wing area	26.0m²	280ft²
Aspect ratio	2.46 : 1	
Length overall	7.05m	23ft 2in
Height overall	2.90m	9ft 6in

Armament

Three 30mm MK 108 cannon in forward fuselage.

The P.217 was consigned to the files when further development of the P.212 succeeded in eradicating most of the latter's shortcomings.



Heinkel P.1078

February 1944

Heinkel worked on this proposal, resembling the Blohm und Voss P.212, during January and February 1945.

Siegfried Günter experienced no little difficulty in fitting some of the components, eg the undercarriage, into the relatively small airframe. The wooden wing, which accommodated the entire fuel load, was mated to an all-metal fuselage.

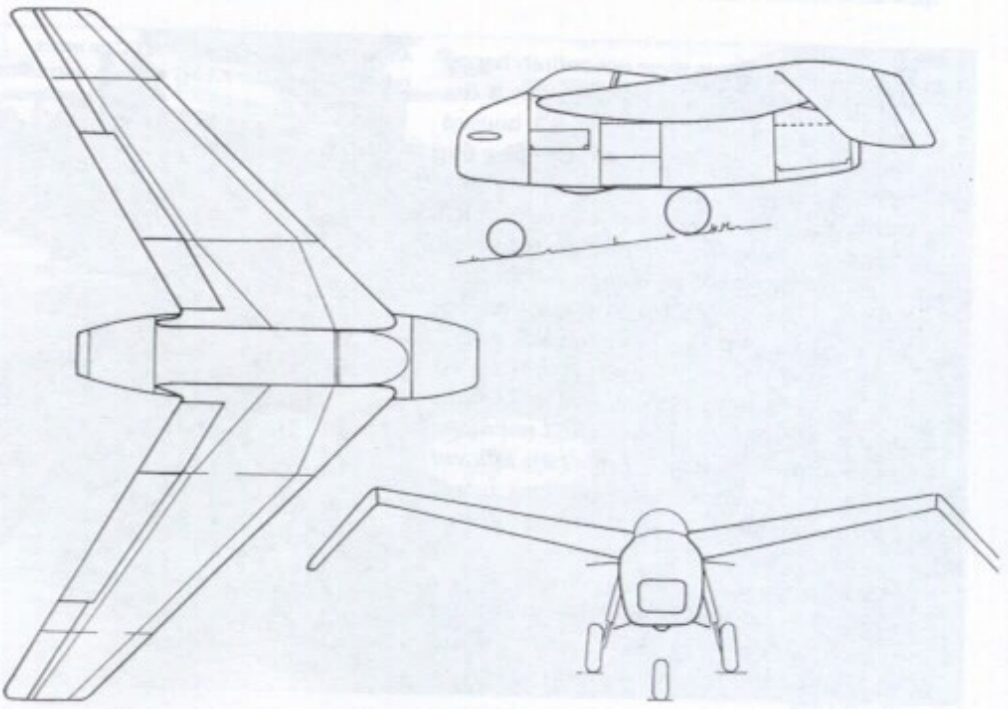
Powerplant

One Heinkel HeS 011 turbojet rated at 1,300kP (2,865lb) static thrust.

Dimensions		
Span	9.00m	29ft 6in
Sweep	40° at 0.25 chord	
Wing area	17.8m²	191ft²
Aspect ratio	4.55 : 1	
Length overall	6.10m	20ft 0in
Height overall	2.35m	7ft 8in

Weights		
Empty equipped	2,454kg	5,410lb
Loaded	3,920kg with	8,641lb with
	1,200kg of fuel	2,645lb of fuel
Max wing loading	220kg/m²	45lb/ft²

Performance		
Max speed	1,050km/h	652mph
	at 7,000m	at 23,000ft
Initial rate of climb	29.8m/sec	98ft/sec
Take-off run	700m	2,296ft
Landing speed	182km/h	113mph



Horten Ho X (Ho XIIIb)

1944/45

Work on this scheme began with the construction of free-flying models, each weighing 8-10kg (17-22lb) and featuring a sharply swept wing of some 3m (9ft 9⅛in) span. These were then used to carry out the first practical flight tests in Göttingen.

In 1943, in order to gain quick results from a manned aircraft, the small company used their Ho IIIb flying-wing glider as the basis to build an experimental glider incorporating 60° leading edge sweep. For camouflage purposes, and to disguise any connection to work on the Ho X fighter, this 12.4m (40ft) wingspan aircraft was given the designation Ho XIIIa. Further work on the supersonic delta continued under the designation of Ho XIIIb. Flight tests with the Ho XIIIa commenced with the first flight on 27th November 1944 and were only terminated by the ending of the war. During that time 20 flights, totalling some ten hours, provided valuable information on the slow speed flight characteristics of the sharply swept flying-wing planform.

Details as to the final layout of the supersonic delta are contradictory. The British Royal Aircraft Establishment Report FA.259/1 of October 1945, for example, states that:

In appearance the Horten X resembles the Lippisch designs for high speed and supersonic aircraft, especially the P.13. Horten declared that he had not known anything of Lippisch's work until arriving in London.

The major difference in the design lies in the fact that Horten regarded a special vertical surface as unnecessary, whereas Lippisch favoured a very large vertical rudder assembly.

It is possible that this last sentence does not refer specifically to the Horten Ho X, but rather to the design philosophy as a whole. In the 1982 book *Flying-Wing, the Story of Horten Aircraft 1933-1960* Reimar Horten himself remarks:

With a half span of only 3.6m and a length of 10m, aerodynamic rudders were no longer sufficient. The Ho X (XIIIb) was therefore equipped with a keelfin from the start. Furthermore, in the trans-sonic flight range an aerodynamic rudder would generate shock waves on the wing's upper surface.

In further work on supersonic aircraft carried out in Argentina in 1953, Reimar Horten and his then colleague, Dr Karl Nickel, also made provision for a relatively large rudder assembly from the outset.

Illustrations of the Ho X and Ho XIIIb often appear in literature. But these do not resemble the descriptions given by Reimar Horten in the above-mentioned book. Using this source, and with the aid of the British report already quoted, which also includes an illustration, an attempt has been made to reconstruct the aircraft. All drawings, calculations and other documentation were presumably lost in the final days of the war.

In 1945 a wooden glider version was under construction, parts of which were found by the British after the capitulation. In a second phase of the development this glider was to have been motorised by fitting an Argus As 10c engine. Only after thorough tests at up to 500km/h (310mph) was the proposed HeS 011-powered supersonic fighter to have been built. This step-by-step procedure adopted by the Horten works was similar to that followed during their development of the earlier Ho IX. From this it is clear that the gestation period of the Ho X would certainly have required several years.

Together with the work of Dr Lippisch, this aircraft represents the first steps on the road to the modern high speed, jet-powered delta-winged aircraft of today. Many years after the war the British tested an aerodynamic concept closely resembling the Horten design with their Handley Page HP.115. The data gathered in subsonic flight by this short span delta with a leading edge sweep of almost 70° was incorporated in the Anglo-French Concorde supersonic transport programme.

Crew

Pilot in prone position in cockpit with slightly curved Plexiglas canopy faired into wing contour.

Powerplant

One Heinkel HeS 011A-0 rated at 1,300kP (2,865lb) static thrust; later a more powerful version with 1,500kP (3,306lb) static thrust; provision for additional rocket booster.

Dimensions

Span	7.20m	23ft 7in
Sweep	Delta with 70° leading edge	
Wing area	37.8m²	406ft²
Aspect ratio	1.37 : 1	
Profile thickness	7%	
Length overall	10.0m	32ft 9⅞in
Height overall (approx)	4.20m	13ft 8in

Weights

Take-off	6,000-7,000kg	13,227-15,432lb
Max wing loading	160-185kg/m²	32.7-37.8lb/ft²

Performance

Max speed	1,200km/h at 6,000m (M= 1.07)	745mph at 19,750ft
Service ceiling	15,000m	49,000ft
Range	2,000km	1,242 miles

Armament

Three or four 30mm MK 108, or three or four 30mm MK 213C cannon.

The Ho XIIIb as represented in post-war literature.

LIPPISCH

Dr Alexander Lippisch was an eminent man of science and extraordinarily gifted designer, and like the Horten brothers, occupies a special place in this survey of German aviation projects. He had at his disposal what was, in effect, his own large aircraft works where his revolutionary ideas, studies and designs – all far ahead of their time – could be realised. Touched by a genius which could at times be decidedly impetuous, he was always dependent on collaboration with established aircraft manufacturers, an arrangement which was not without its complications and which did not always run smoothly. After all, each of these manufacturers had their own ideas, development programmes and chief designers who did not, indeed should not, want to be made to feel inferior to Lippisch and his work.

It was not until he moved to Vienna that he was given his own works with a staff of 110. This factory had previously produced water heaters, and the only knowledge of aircraft manufacturing it possessed was purely from hearsay. The conversion to the building of wooden aircraft was particularly difficult, as almost all of the necessary machinery was lacking. By the end of the war, apart from a few models, they had succeeded in producing just the centre fuselage section of the Delta VI V1.

After more than four years of collaboration with the Messerschmitt company at Augsburg – years marked with successes, but also with jealousies and petty intrigues – Dr Lippisch became head of the Luftfahrtforschungsanstalt (LFA – Aviation Research Institute) in Vienna, which was part of the LFA Munich-Ottobrunn organisation.

During his time with Messerschmitt, apart from the Me 163, Lippisch had been responsible for a wide range of designs intended for the most diverse of purposes and roles. The studies into jet fighters which he carried out there during the early war years are covered in some detail as these clearly document the very beginnings, the first tentative steps, towards today's modern single-jet fighters. While so doing, Lippisch had anticipated much which would not become common knowledge and practice in aviation technology until many years later. Even at the end of the war, his was still a progressive influence at Messerschmitt; as witness the Enzian surface-to-air missile, the P.1111 and P.1112 tailless fighter designs and the projected P.1108 long range bomber.

In Vienna he concentrated more and more on new wing forms and new methods of propulsion. He broke new ground with his work, begun in the 1920s, on the delta wing and with his studies in the field of ram jet engines, in particular of new types of combustion chambers and the use of solid fuels.

In addition to this pioneering research work, which he backed up with wind tunnel tests and flight trials using models, there was also a whole range of projects which could be realised fairly quickly and which Lippisch wanted to build in experimental and operational form in collaboration with other manufacturers such as Henschel. Examples of the latter were the ram jet-powered P.13a and 'b, and the twin-jet Delta VI fighter, whose performance was superior to that of the Me 262 but which was constructed of 'non-essential' tubular steel and plywood.

One last observation regarding the designations used by Lippisch. At Messerschmitt he began with Project (P).01 and ended with P.20. He retained most of these designations after the move to LFA in Vienna, but renumbered a few and altered the original design or role of others several times. In Augsburg, for example, his design in competition to the Do 335 was designated P.13. Later, in Vienna, he used P.13 to identify the ram jet-powered fighter mentioned above. Work on the P.11 fast jet bomber was also begun at Messerschmitt, was initially continued as such at LFA in Vienna, but then formed the basis for a fighter which, referring back to even earlier work, was finally designated 'Delta VI'. This represented an almost completely new aircraft when compared to the original. Examples such as these can, and have, led to a certain amount of understandable confusion.

Lippisch Project P.01

In January 1939 Alexander Lippisch and his team had left the Deutsches Forschungsinstitut für Segelflug (DFS – German Research Institute for Sailplanes) at Darmstadt to go to Messerschmitt at Augsburg. There, backed by the industrial giant and on behalf of the RLM, he was to work on a project for a tail-less experimental aircraft to be powered by the new-style rocket engine. Upon the outbreak of war, however, the Ministry withdrew the bulk of its support for the futuristic 'Projekt X' aircraft which, for reasons of secrecy, was given the RLM number 8-163; a number which had already been allocated to another Messerschmitt design intended as a competitor to the Fieseler Fi 156 Storch liaison aircraft.

Lippisch, who had foreseen this development, therefore turned his mind, in keeping with the times, towards a military application for his project. From the designs of April 1939 there thus emerged an interceptor fighter which, after the successful flights of the DFS 194 experimental aircraft and the considerably more advanced Me 163A, again found wide support from the RLM. The end result of all these endeavours was the emergence of the now familiar operational Me 163B Komet. (Pure rocket-propelled fighters are a study in their own right and are dealt with in this book only when they relate to turbojet or mixed-powerplant developments.)

Back in 1939, and with some justification, Lippisch did not entirely trust the new rocket engine, which was then still under development and suffering all sorts of problems. He therefore kept all his options open with regards to the powerplant of his proposed operational fighter, not wishing to see the whole project brought to a halt should – as seemed quite likely – the rocket engine prove a complete failure. So, in addition to the rocket-powered P.01 proposals, he produced a number of designs to be powered by the equally new turbojet engine, of which no operational examples – it must be admitted – existed either. Nonetheless, Lippisch's work was distinguished, above all, by its combination of a new form of propulsion allied to new

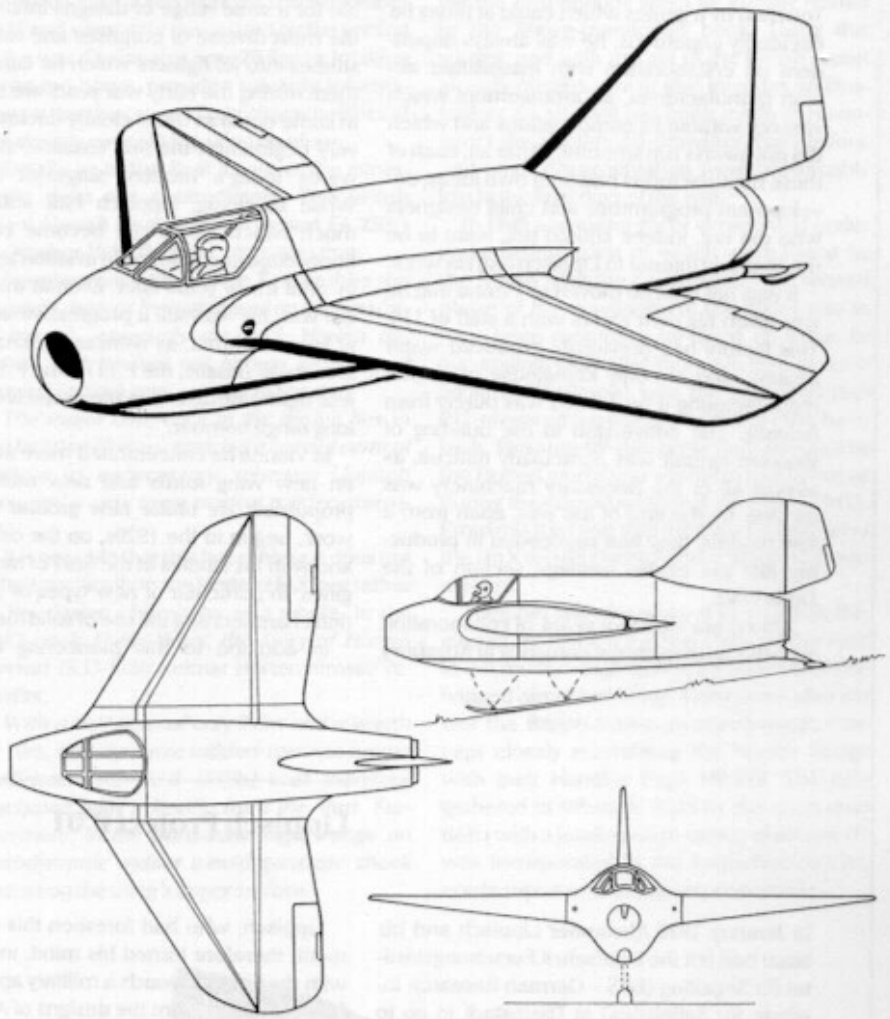
aerodynamic principles. Taken together, these should have given the aircraft excellent flight characteristics, which unfortunately it is now impossible to substantiate due to a complete lack of performance data.

These projects represent the first tail-less aircraft to be powered by jet propulsion. The tests on wing sweep carried out at this time in the wind tunnel of the Aerodynamische Versuchsanstalt (AVA – Aerodynamic Research Institute) in Göttingen were almost certainly used as a basis for the design.

Initially, as a military variant of the Me 163 experimental aircraft, the P.01 was given the RLM designation 8-263. Then in 1941 it received the designation Me 327. But when the experimental aircraft was finally designated the Me 163A, and the direct operational derivative became the Me 163B, the RLM number 263 was allocated to the further development of the latter. In the autumn of 1944 project Me 327 was cancelled in favour of the Me 163B.

Armed Me 163A within project P.01

The origins of the Me 163A experimental aircraft, which made its first unpowered flight on 13th February 1941, lay in the DFS 39. Construction of the Me 163A was carried out by Lippisch and his team in the spring and summer of 1939. When Lippisch received the first, still vague, details of the turbojet engine, he produced an initial study in April 1939 for a small experimental aircraft featuring a nose intake and an unusual – for him – short span wing layout somewhat reminiscent of the Lockheed F-104 Starfighter.



Dimensions

Span	7.50m	24ft 7in
Sweep*	approx 24°	
Wing area	19m²	204ft²
Aspect ratio	2.96 : 1	
Length overall	6.60m	21ft 7in
Height overall	3.20m	10ft 6in

*reduced sweep in region of the ailerons

Weights

Empty equipped		2,200kg	4,850lb
Loaded weight		4,270kg with	9,413lb with
		2,100 litres of fuel	461 gallons of fuel
	Me 163A	2,400kg	5,291lb
Initial wing loading		225kg/m²	46lb/ft²
	Me 163B	203kg/m²	41.5lb/ft²

Performance No data available.

Armament

Two 15mm MG 151 cannon in wing roots.

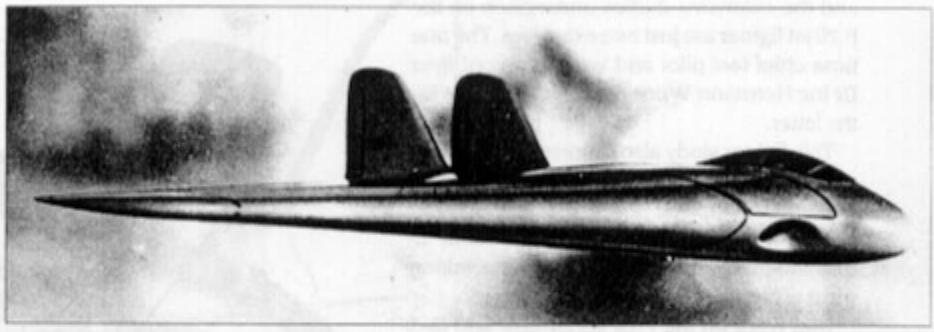
Lippisch P.01-111

20th October 1939

In a speech delivered in July 1965, Dr Lippisch explained that this design was, in effect, an armed version of the Me 163A. The powerplant was to be an early Junkers turbojet as conceived by Max Adolf Müller. The wing displayed the usual Department 'L' (the Lippisch design bureau) form and sweep, albeit with a smaller aspect ratio when compared to the Me 163A. See specification table to left.

Lippisch Delta VI twin-jet single-seat fighter

February 1944



At Augsburg in the late summer of 1942 Alexander Lippisch was working on the P.11 twin-jet fast bomber, designed to carry a weapon load of 1,000kg (2,204lb). A number of variants were proposed, both with and without horizontal tail surfaces, before the P.11 Schnellbomber (Fast Bomber) emerged in its final form in May 1943. But when the Technische Amt in Berlin decided in favour of the Horten brothers' Proposal IX, Lippisch ceased work on the P.11.

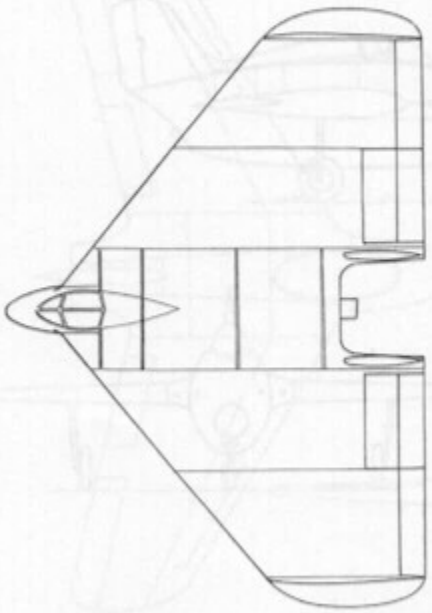
In August 1943 he then received an official contract from the RLM to develop a 'Very Fast Bomber' to be based on his earlier research. Lippisch designed a pure delta-winged aircraft with a straight trailing edge. This initially continued to run under the designation P.11. As before, the powerplant was to be a pair of Junkers Jumo 004 turbojets. With the completion of design work on an unpowered glider which was to serve as the initial prototype (V1) for the operational model, the project was renamed 'Delta VI'. At the same time the RLM began to re-exert pressure, bestowing the highest 'DE' priority on the delta which was now to be produced in a fighter version as well. The LFA constructed models and mock-ups, carried out wind tunnel tests and slowly made ready for production.

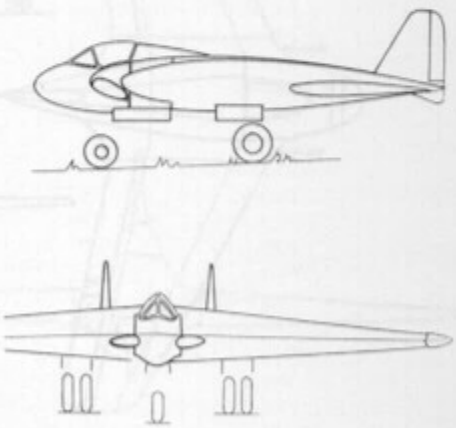
By February 1944 design work on the Delta VI V2, the prototype for the proposed fighter, fighter-bomber and Zerstörer (heavy fighter) models, was nearly complete. It was intended that the actual construction of the four contracted prototypes was to be undertaken by the Henschel works in Berlin. But this remained an intention only. After a lot of to-ing and fro-ing, Lippisch seized the initiative and began building the glider in Vienna at the beginning of 1945. The centre section of the Delta VI V1, the only part of the aircraft to have been completed by the capitulation, fell into the hands of the Americans at Salzburg.

The design and construction of the airframe proved of considerable interest: In contrast to the Delta VI glider, which was built entirely of high grade plywood, the remaining three prototypes were to be of rigid monocoque construction, as were the operational models when series production commenced. Neither variant made use of a load bearing frame. The stressed skin, formed in simple fashion around a mould, consisted of a filler layer between two outer load bearing layers. The layers were made of Dynal and Tronal, two synthetics developed by Dynamit Nobel of Troisdorf. The synthetics content of the airframe was between 50 and 60%. The aerodynamic shape, the method of construction and the materials used gave the aircraft what would become known as good 'Stealth' characteristics.

The low wing loading promised not only a good climb capability, but also excellent manoeuvrability. From his previous experience with delta-winged aircraft, Lippisch ruled out any danger of a propensity to spin.

On 31st January 1944 Lippisch expressed the hope of being able to commence flight tests with the unpowered glider in April/May; the Delta VI V2, powered by two Jumo 004B turbojets, then being ready to fly in July 1944. By the end of 1944 Henschel had still not begun construction of the prototypes and disagreements between the Berlin firm and Vienna grew increasingly bitter. Nothing is known of the reasons for the delay.





Powerplant

Two Junkers Jumo 004B each rated at 900kP (1,984lb) static thrust, plus four RI-503 solid fuel booster rockets, each of 2,000kP (4,409lb) rated thrust, to assist take-off. The installation of the powerplant was such that, as with the Horten Ho IX, it could not be exchanged for other units without costly modification.

Dimensions		
Span	10.80m	35ft 5in
Sweep	37°, leading edge	
Wing area	50.0m²	538ft²
Aspect ratio	2.33 : 1	
Wing profile	relative thickness of 17% at the wing root and 9% at the wing tip.	
Length overall	7.49m	24ft 6in
Height overall	2.76m	9ft 0in

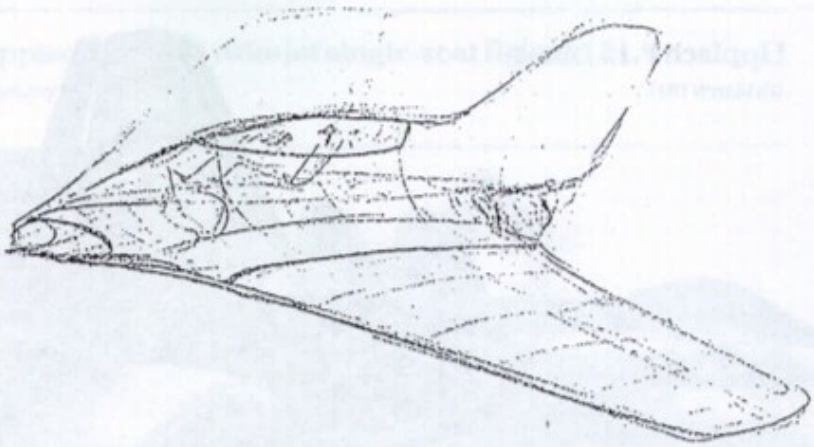
Weights	(F=fighter, FB=fighter-bomber, Z=Zerstöer)		
Airframe	F	2,000kg (approx)	4,409lb
Loaded	F	7,260kg	16,005lb
		with 3,600 litres of fuel in wing	with 951 gallons of fuel in wing
Max loaded wt	FB & Z	8,000kg	17,636lb
Max wing loading	FB	145kg/m²	29.7lb/ft²
	Z	160kg/m²	32.7lb/ft²

Performance		
Max speed	1,040km/h	646mph at
	at 6,000 to 8,000m	19,750 to 26,250ft
Time to height	15mjn to 10,000m	32,800ft
Range at 8,000-10,000m	approx 3,000km	1,864 miles

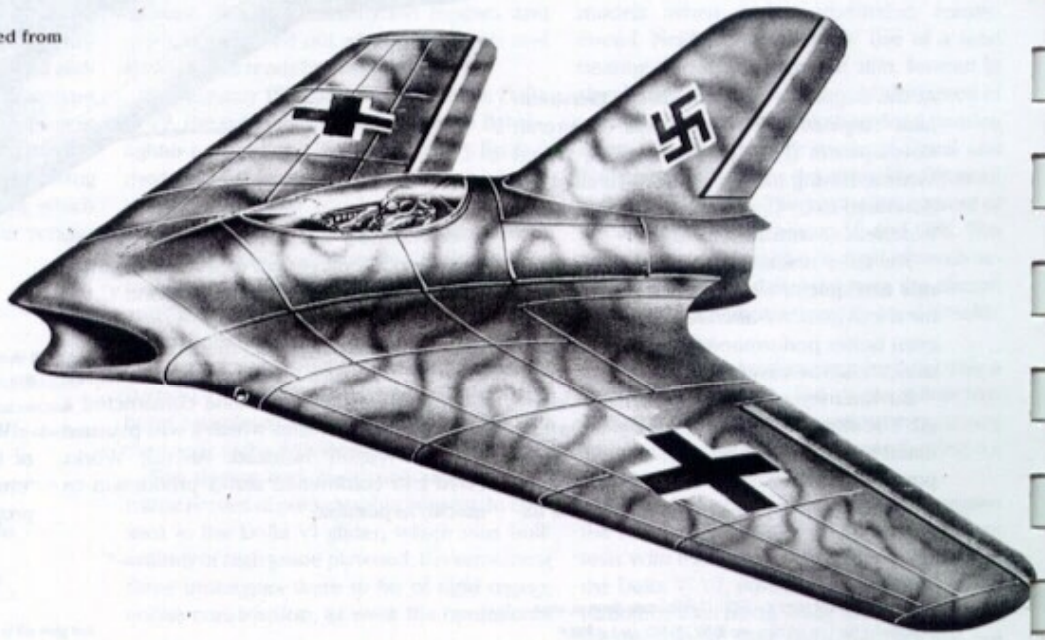
Armament

Two 30mm MK 103 wing-mounted cannon; plus provision for additional two 30mm MK 103 cannon or one 75mm BK 7.5 or Düka 75 heavy cannon in external pack(s). Weapon load: max 1,000kg (2,200lb).

Sketch in Lippisch's hand showing the initial thinking around the P.15.



Artist's view of the initial P.15 developed from Professor Lippisch's sketch.



MESSERSCHMITT

The aviation industrialist and designer Willy Messerschmitt played an outstanding role in the creation of the jet fighter from the very beginning. As early as 1940 the RLM had directed him to develop his P.1065 project, which would eventually result in the Me 262. At the same time his project bureau put forward plans for the P.1070. Compared to the P.1065, this was a somewhat smaller, but appreciably lighter and aerodynamically more sophisticated design, parts of which (eg wing structure and nosewheel) would also later be incorporated into the definitive Me 262.

After these initial projects not a lot happened. Urgent war work, together with Göring's ban on development, were having their effect. It was not until some years later that further fighter proposals would be made. At the beginning of 1943, despite nearly all its resources being occupied in the series production of such types as the Me 262 and Me 163, in research work on the Me 328 pulse-jet fighter and Me 264 long range bomber, and in the continuing development and upgrading of the Bf109, the company was to launch a new phase in jet aircraft development. Messerschmitt firmly believed that Germany could get by with, and should concentrate on, just one tenth of the number of aircraft types currently in series production. With his P.1090 and P.1092 projects, and his plans for possible other roles for the Me 262, he was, in fact, proposing the adoption of pure multi-purpose aircraft programmes. It was out of further design work on the P.1092 multi-purpose weapons system that a whole range of proposals for single-jet air superiority fighters was to originate.

In mid-1944, a good 12 months later, the chief of the project bureau, Dipl-Ing Woldemar Voigt, and the head of feasibility studies, Dipl-Ing Hans Hornung, used these proposals as a basis to start work on a single-jet successor to the Me 262.

Via projects P.1101 – of which an experimental prototype was built at Oberammergau – and P.1106, the way finally led to the advanced P.1110, P.1111 and P.1112 designs. These represented a wide spectrum of ideas and solutions which anticipated much of what was to become state-of-the-art technology for decades after the war. The victorious powers saved themselves colossal sums in research and development costs.

Gotha P.60A heavy fighter

January 1945

The Gotha P.60 heavy fighter the project resulted from the development work carried out by the Gotha company on the Horten Ho IX. This was initially intended to culminate in series production as a structurally improved Go 229.

Gotha was requested by the Oberkommando der Luftwaffe (OKL – Luftwaffe High Command) to incorporate the experience gained from the Horten Ho IX/Go 229 into a new design.

OKL requirements included:

- A crew of two.
- A pressure sealed high altitude cabin.
- A standard tricycle undercarriage.
- A greater range than the Go 229.
- The option of installing more powerful engines.

Gotha's head of design, Ing Hünerjäger, and his chief aerodynamicist, Dr Göthert, also incorporated the latest high speed research into their design, a move which was not accepted without a certain amount of reservation by Walter and Reimar Horten. They also evaluated the most recent developments in alternative construction and the running and operation of turbojet engines.

Structurally, the P.60A and P.60B were identical. The crew was accommodated in a prone position in a pressure sealed cabin fully faired into the nose contours. The airframe consisted of a plywood-skinned tubular steel centre section structure with all-wooden, lattice work outer wings.

Elevators and ailerons were combined in the one control surface (elevon) on the trailing edge of each outermost wing section. Rudder control was provided in a highly unusual manner; two telescopic control surfaces being simultaneously extended above and below each wingtip. Fuel was carried in the outer wings and in a centre-section tank.

Crew

One pilot and one radio operator/navigator in prone position.

Powerplant

Two BMW 003 each rated at 800kP (1,763lb) static thrust.

Dimensions

Span	12.40m	40ft 8in
Sweep	46° at 0.25 chord	
Wing area	46.8m²	503ft²
Length overall	9.50m	31ft 2in
Height overall	3.15m	10ft 4in

Weights

Empty equipped	4,190kg	9,237lb
Loaded	7,450kg with approx 2,500 litres of fuel	16,424lb with approx 550 gallons of fuel

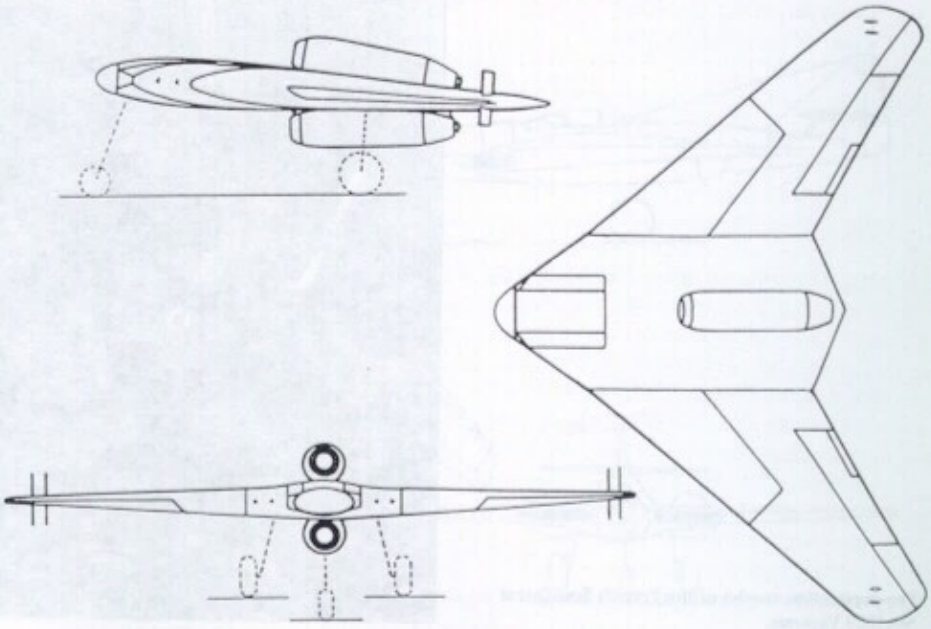
Performance

Max speed	915km/h at 7,000m	568mph at 20,000ft
Initial rate of climb	14m/sec	46ft/sec
Service ceiling	12,500m	41,000ft
Time to 8,000m	14.1 minutes	26,250ft
Time to 10,000m	21.5 minutes	32,800ft
Endurance at 100% thrust	approx 2 hours at 12,000m	39,000ft
Range at 100% thrust	approx 1,600km at 12,000m	994 miles 39,000ft

Armament

As heavy fighter: Four 30mm MK 108 or two 30mm MK 103 cannon in wing centre section to left and right of crew cabin.

As reconnaissance aircraft (secondary role): two Rb 50/18 cameras.



Gotha P.60B heavy fighter

March 1945

On 28th February 1945 the General der Jagdflieger (Air Officer Commanding Fighters) laid down new requirements for both single- and twin-jet fighter projects.

His demands included, among other things, a more comprehensive equipment fit and, above all, a greater endurance. Take-off on grass should not exceed 1,000m (3,250ft). Ing Hünerjäger and Dr Göthert therefore decided to enlarge their original P.60 design into the P.60B, while still continuing development of the former as an 'immediate solution' under the designation P.60A as described above.

The company proposed a third variant, designated the P.60C, as their tender to the night fighter specification issued on 27th January 1945. But the capitulation of Germany in May perforce denied the designers and aerodynamicists of the Gothaer Waggonfabrik any practical demonstration of their ideas and proposals. It is only today, after decades of being a mere pipe dream, that the aerodynamic planform championed back in 1945 has re-emerged centre stage in the shape of America's so-called 'stealth' bomber, the Northrop B-2A Spirit.

Crew
Pilot and radio operator in pressure sealed cabin.

Powerplant
Two Heinkel HeS 011 turbojets each rated at 1,300kP (2,865lb) static thrust. Provision for additional 2,000kP (4,409lb) thrust rocket motor.

Data below for the heavy fighter variant unless given with an 'R' for the reconnaissance (secondary) role.

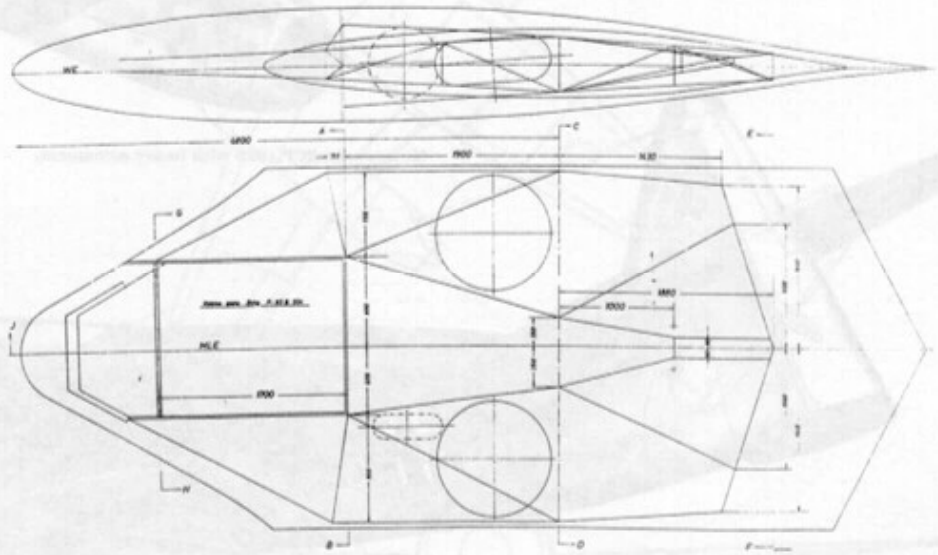
Dimensions			
Span		13.50m	44ft 3½in
Sweep		46° at 0.25 chord	
Wing area		54.7m²	589ft²
Aspect ratio		3.3 : 1	
Length overall		9.90m	32ft 6in
Height overall		3.50m	11ft 6in

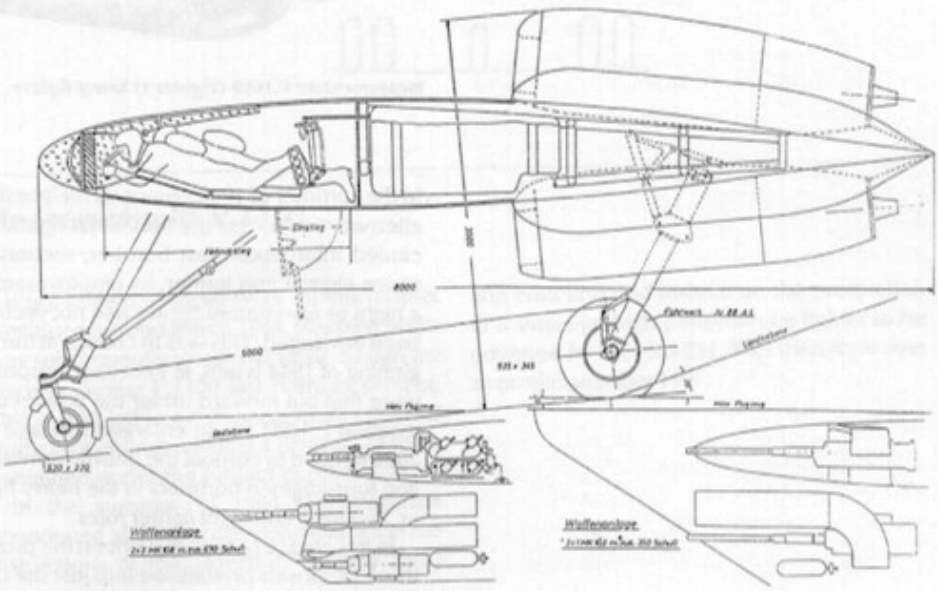
Weights			
Empty equipped		5,161kg	11,377lb
Loaded		9,953kg with	21,942lb with
		3,500kg of jet fuel	7,716lb of jet fuel
Loaded (max)	R	11,000kg with	24,250lb with
		2,600kg of jet fuel	5,731lb of jet fuel
		plus 1,700kg	plus 3,747lb
		of rocket fuel	of rocket fuel
Max wing loading		182kg/m²	37.2lb/ft²
	R	201kg/m²	41lb/ft²

Performance			
Max speed		980km/h at 6,000m	608mph at 20,000ft
Initial rate of climb		19m/sec	62ft/sec
R		60m/sec	196ft/sec
Time to height	30.5 min	to 14,000m	46,000ft
R	2.6 min	to 9,000m	29,500ft
Max Endurance	2.4 hrs	at 14,000m	46,000ft
R	3.7 hrs	at 14,000m	46,000ft
Max Range		approx 2,800km+	1,739 miles+
		at 14,000m	46,000ft
R		2,100km	1,304 miles
		at 14,000m	46,000ft

Armament
As Heavy Fighter:
Four 30mm MK 108 or four 30mm MK 213C cannon in wing centre section to left and right of crew cabin. Weapon load: provision for weapons racks. As reconnaissance aircraft (secondary role): one Rb 50/18 and One Rb 30/18 cameras.

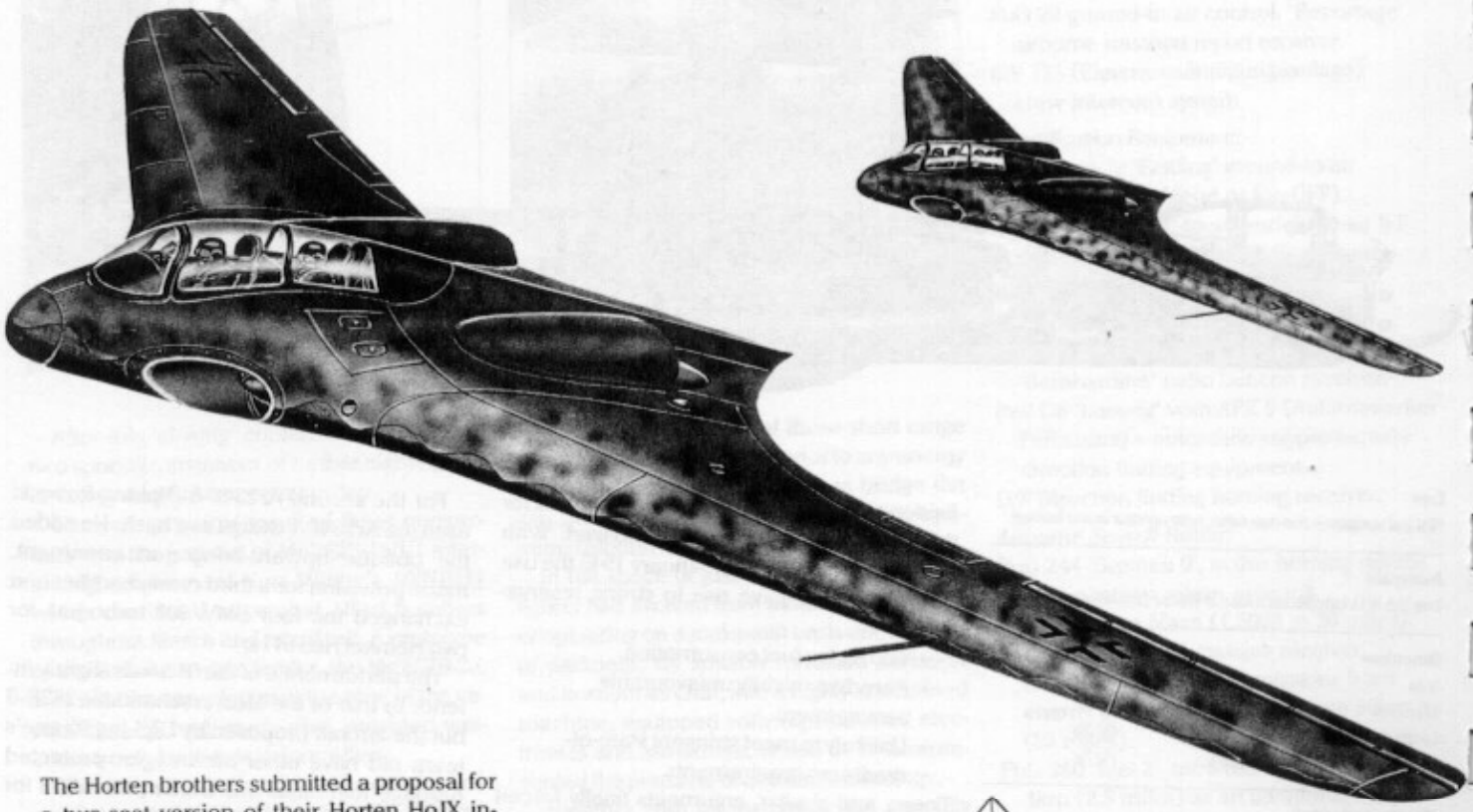
Radio equipment
FuG 15 R/T, FuG 25a IFF and FuG 125 radio beacon receiver.





Horten Ho IXb (8-229B-1/Go 229B)

1st March 1945

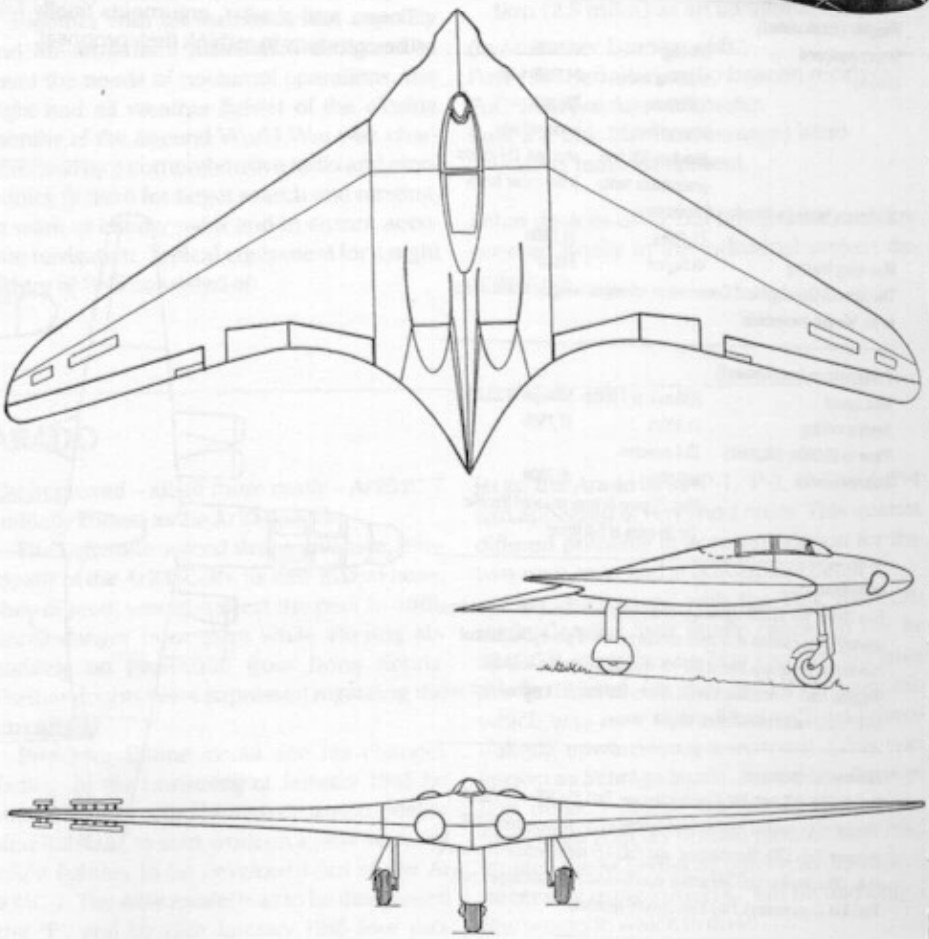


The Horten brothers submitted a proposal for a two-seat version of their Horten Ho IX intended, among other roles, for service as a night fighter. Shortly thereafter this small company received specifications from the TLR for an 'all-weather day and night fighter'

As an 'immediate solution' the night fighter variant of the two-seat multi-purpose aircraft had a decided advantage over such types as the Ar 234P-5, Do 335B-6 or Me 262B-2 in that it would be built almost entirely of tubular steel and plywood and thus at appreciably less cost. Nor was that by any means all. In 1950 Dr Reimar Horten was to say of his design: *As wooden surfaces offer very little reflection to electric waves, they are almost invisible on the radar screen. And as a fighter pilot must, and should, utilise the element of surprise to the full, especially by night, so should his aircraft be constructed of wood ...*

The Hortens had also listed other advantages in their original submission, such as higher speed, lower wing loading, good climb capability and, not least, considerably extended endurance; each and every one of particular import for a night fighter.

The Horten Ho IX V6 was to be the prototype for the two-seater variant. Partial assembly had already begun prior to the Reich's capitulation. Under even halfway normal circumstances, the chances of series production would not have been bad. Göring for one was a firm believer in the two brothers' work.



Crew
Pilot and radar operator/observer in ejection seats in armoured pressure cabin.

Powerplant
Two Junkers Jumo 004B-2 turbojets each rated at 910kP (2,006lb) thrust. Alternative option of two BMW 003A-1 each rated at 800kP (1,763lb) static thrust. (For structural reasons installation of the Heinkel HeS 011 could only have been carried out with the greatest difficulty.)
Two 1,000kP (2,204lb) take-off rockets as additional field conversion set.

Dimensions

Span	16.76m	54ft 10⅞in
Sweep	28°	
Wing area	53.6m²	576.9ft²
Aspect ratio	5.2 : 1	
Length overall, approx	8.50m	27ft 10⅞in
Height overall	3.05m	10ft 0in

Weights

Empty equipped	5,200kg	11,463lb
Normal loaded	8,650kg with	19,069lb with
	1,850kg of fuel	4,078lb of fuel
Max loaded	10,500kg with	23,148lb with
	3,500kg of fuel	7,716lb of fuel
Max wing loading	196kg/m²	40lb/ft²

Performance
At normal take-off weight with two Jumo 004s.

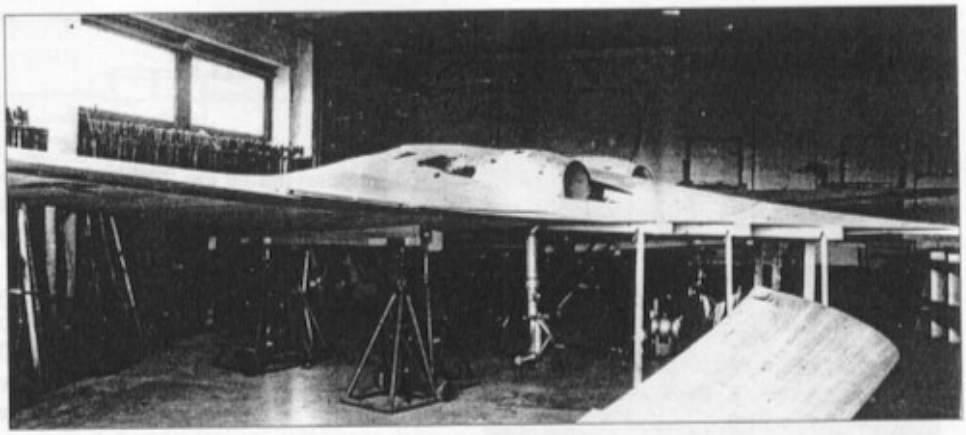
Max speed at ground level approx	950km/h	590mph
Initial rate of climb	16.4m/sec	53.8ft/sec
Service ceiling*	15,000-16,000m	49,000-52,500ft
Range	2,080km	1,292 miles
Range with max fuel load	4,600km	2,858 miles

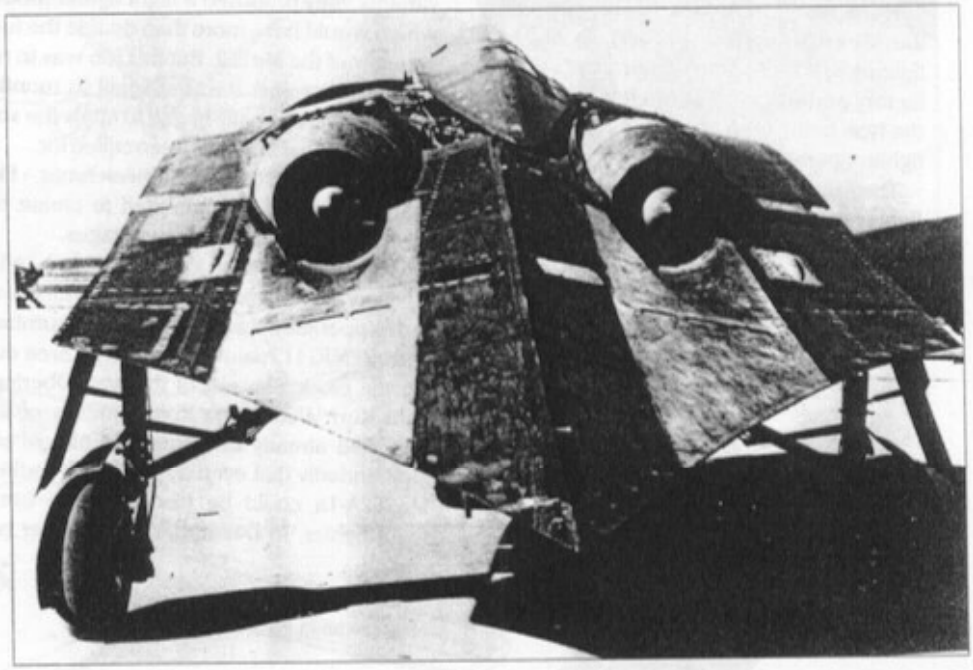
*Powerplant data insufficient to determine exact ceiling.

Armament
Four 30mm MK 108 fixed forward firing cannon, additional 24 to 36 R4M unguided air-to-air rockets optional.

Electronic equipment
The Oberkommando der Luftwaffe (OKL – Luftwaffe High Command) specified that FuG 244 'Bremen 0' search radar was to be installed. This could be accommodated quite easily in the nose section.

Braking
Saw-toothed ventral brake under centre-section. Braking parachute reefed (gathered in) and unreefed.





Top right: **HoIX second prototype under construction.**

Centre right and bottom right: **Two views of the uncompleted HoIX V3 centre section. This is held in storage at Silver Hill, Maryland, by the US National Air and Space Museum.**